

Dome Rotate Limits

When the shutter is powered by the cable you have to limit the dome's revolutions to avoid cable break that is rolling around the pier. It may cause that the dome cannot rotate freely. In such cases there is a need to limit the angle range within the dome's movement is allowed.

ScopeDome USB Driver lets you to limit the dome's movement in three ways:

- A. the angle range within the dome's movement is allowed (parameter: From/To)
- B. the maximal value of the angle the dome can rotate in relation to Home position (parameter: Max Rotate Angle)
- C. the maximal value of the dome's position counter in relation to Home position (parameter: Az Counter Max Value i Az Counter Min Value)

First two options (A&B) are implemented by the driver's software and work only when the dome is controlled from the application level. Third option (C) is hardware implemented and works independently from PC, even when you control the dome by the buttons on the ScopeDome USB Card panel.

Attention!

Never use options A&B at the same time! You need to decide what option will be the best and the most suitable for you and then configure the parameters just for chosen one. Using both options at the same time will cause a malfunction of modules that manage dome's revolution.

Note that you cannot set the limit parameters in such way that Home Sensor position is in forbidden range of the dome's movement. If for some reason, such position is necessary, you should change Home Sensor position manually, by mounting it in a different place. Proper operation of the software that controls dome's rotation is possible only if the dome is able to set in Home position - the place where HomeSensor is mounted.

After setting the parameters, the driver examines their correctness. If any errors occur then the warning info will display on the screen and all limit parameters will be reset, so they should be entered again.

Setting From/To and Max Rotate Angle parameters with the value of 0 (zero) means that the dome is not limited and can rotate freely any range of angles or revolutions.

We suggest to use the option B (Max Rotate Angle). In this mode the dome will rotate from „Dome Az” position to given azimuth „GoTo Az” choosing the shortest way. The dome will choose the longer way to unwrap the cable only from time to time.

We suggest to learn and study the limit options in the simulator mode. That mode works with no physical connection between PC and the USB card. It allows to perform free experiments with no risk that something will go wrong.

Simulation mode should be established in „Card Config” tab, „Card Type” field, „Simulator” option.

A. Option: From-To

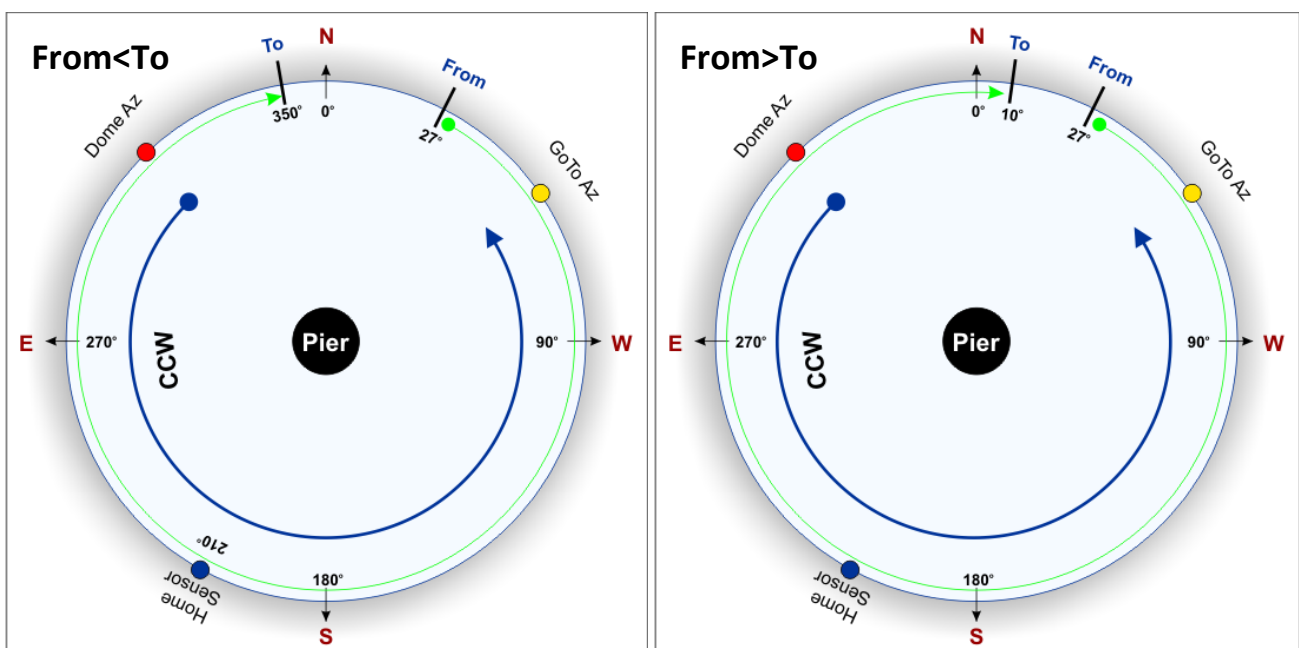
The angles range should be entered in „Rotate Limits” panel, „Dome” tab, „Config” window.

The angle of 360° is treated as 0° (zero). The angles are counted from 0 to 360 degrees in CW direction.

Rotate Limits	
From	0
To	0
Max Rotate: (Angle)	180

There are two acceptable ways to specify parameters From-To:

- First, when "From < To" (From is less than To), allows to determine the allowable ranges of angles of the dome's movement, e.g. from 0° to 355°, or so as the accompanying figure from 27° to 350°.
- Second, when "From > To" (From is greater than To), allows to prohibit the dome's movement in given ranges of angles, e.g. from 0° to 10°, or so as the accompanying figure from 10° to 27°.



Legend:

- green arrow indicates the acceptable range of angles of movement of the dome
- blue arrow shows what direction the dome will rotate
- red circle indicates the initial position of the dome
- yellow circle indicates the position to which the dome rotates
- blue circle indicates the position of Home Sensor

B. Option: Max Rotate Angle

The parameter should be entered in „Rotate Limits” panel, „Dome” tab, „Config” window.

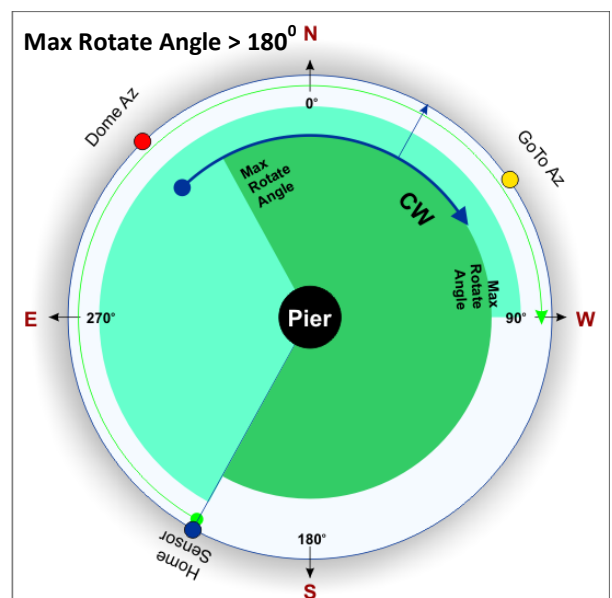
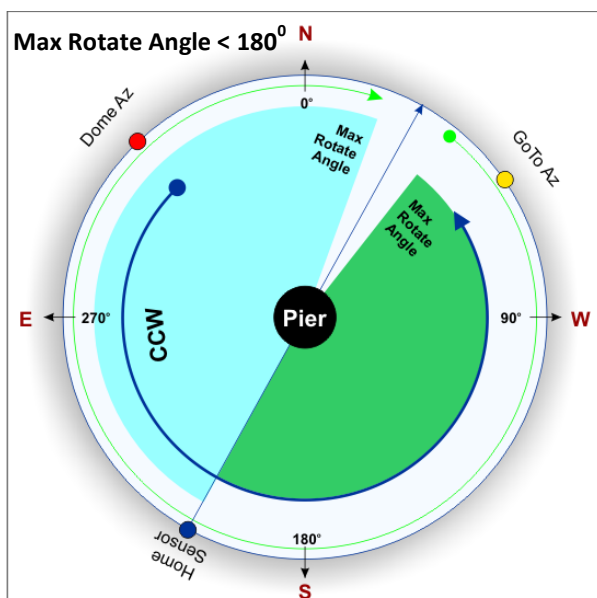
Rotate Limits		
From	<input type="text" value="0"/>	°
To	<input type="text" value="0"/>	°
Max Rotate: (Angle)	<input type="text" value="180"/>	°

Rotation angle is counted from "Home Sensor" position in CCW i CW directions. „Derotate Counter” is used to count it. „Derotate Counter” value is recalculated to „Max Rotate Angle” value according to „Az Counter Scale” parameter value.

Functioning of limit of the dome's movement established in such way depends on the place where we reset „Derotate Counter”. Therefore it is necessary to reset it setting the dome in "Home" position before or at any other position in which the shutter control cable is completely unwrapped. „Derotate Counter” is reset by clicking „Reset Dome Derotate Counter” button in „Dome Mechanics” panel, „Dome” tab, „Config” window.

Dome Mechanics		
Az Counter for 360°	<input type="text" value="900"/>	clk
Az Counter Scale	<input type="text" value="0,4"/>	°/clk
<input type="button" value="Reset Dome Derotate Counter"/>	<input type="button" value="Reset Dome Main Counter"/>	
Derotate: 0	<input type="button" value="Calibrate"/>	
Main Counter: 0		
Sensors Position		
Home Position	<input type="text" value="0"/>	°
Park Position	<input type="text" value="0"/>	° <input type="button" value="Set"/>

- If we enter the value less then 180° in „Max Rotate Angle” field (gap) , the dome will never perform a full revolution counting from the position where „Derotate Counter” was reset.
- If we enter the value that equals 180° , the dome will be rotating 180° in CW and CCW direction.
- If we enter the value that equals 360° , the dome will be performing a full revolution in both directions.
- The value of the angle should be chosen in such way to assure that in the full range of the established dome's movement there is no danger of shutter cable break . Note that as the angle is greater, the greater is observation comfort , because the dome will be more likely to move in the shortest possible path. We recommend setting this parameter to at least 270° - if it is allowed by the cable length.



C. Option: Az Counter Min/Max Value

Min and Max ranges of the dome's position counter we entered in „Card Configuration” panel, „Card Conf.” tab, „Config” window.

The screenshot shows the 'Card Configuration' window with the following settings:

Parameter	Value	Unit
Card Type	Simulator	
USB Card Address	0	
Counter DebounceTime	2	ms
Sensors Debounce Time	30	ms
Az Counter Max Value	900	clk
Az Counter Min Value	-900	clk
Low Shutter Battery Treshold	11	V
Low Dome Battery Treshold	11	V
AutoSavePosition (for 1.0 Card)	<input type="checkbox"/>	
Negative HomeSensor	<input checked="" type="checkbox"/>	
Delta temperature for Fan/Heater control	0	°C
Max Fail Signal Count before shutter close	5	clk
Card Sensors Loop Time	5	s

While configuring the program after setting the dome in "Home" position, please reset „Main Counter”. It should be done by clicking „Reset Dome Main Counter” button in „Dome Mechanics” panel, „Dome” tab, „Config” window.

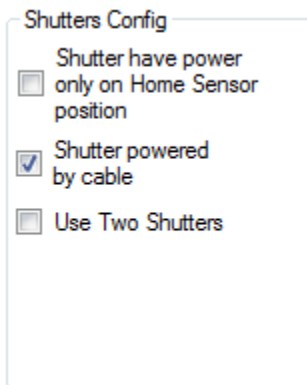
During passing "Home" position „Main Counter” is automatically reset. It allows to increase the accuracy of GoTo procedures.

During the movement of the dome, depending on its direction, "Main Counter" of the dome's Az (azimuth) position is incremented or decremented. If you want to establish hardware limits of the dome's movement, you have to fill „Az Counter Max Value” and „Az Counter Min Value” gaps with respectively the maximum and minimum values the counter can reach. Limits operation is irrespective of other parameters limiting the movement of the dome and overrides them. Therefore it is necessary to ensure that the values are not mutually exclusive.

If the shutter cable length allows, it is best to enter these fields with the values at least equal to „+/- Az Counter For 360”.

For example, if you want to establish a hardware limit movement of the dome to 360° in CW and CCW direction around "Home Sensor", you must enter in "Counter-Az Min Value" box the value that equals minus "Az Counter for 360" (according to the example illustrations -900), and in "Max Az Counter Value" box - the value that equals plus "Az Counter for 360" (according to the example illustrations 900).

Parameters defining the power and control of the shutter



Shutters Config

- Shutter have power only on Home Sensor position
- Shutter powered by cable
- Use Two Shutters

„Shutters Config” panel modifies the way to introduce opening/closing commands of the shutter. Depending on these parameters settings, the driver will control the shutter in different way at the moment you want to open/close it.

When „Shutter have power only on Home Sensor position” option is selected, the driver first will perform "Find Home" or "GoTo Home" procedure before opening or closing the shutter. This means that before opening or closing the shutter the dome is always set at "Home". Additionally, if you activate "Shutter powered by cable" option, then "GoTo Home" procedure will be performed, which means just GoTo Az (Home position in this case) - the shortest possible way regarding to the limits of motion.

When „Shutter powered by cable” option is not active, then the hardware will search for "Home Sensor before opening or closing the shutter. This means that the dome will rotate in CCW direction until the Home sensor signal is detected. In this case, the movement of the dome will ignore the limits defined in "Rotate Limits" panel.

To learn these parameters function profoundly, we suggest to use the dome simulator.

The „Use two Shutters” option in the driver's 3.0.0.05 version does not modify ScopeDome shutters opening procedure. It is designed to work with the domes of other manufacturers. In the future it will allow to determine the sequence of automatic opening for domes equipped with double shutter.

Automatic closing the shutter

Auto Close Shutter on Signal From

Auto Close Shutter on signal

- Cloud Sensor
- Rain Sensor
- Free Input
- No Power
- Low Dome Battery
- Low Shutter Battery
- Bad Weather
- PC Link

ScopeDome USB Card v.2.0 can automatically close the shutter with no PC support. Closing the shutter is initiated by the signals from the sensors connected to the card. When you want the given input to be used by the card and cause automatic closing the shutter, you have to select a proper option in „Auto Close Shutter on signal” panel.

We can automatically close the shutter in following cases:

- the sky is cloudy ("Cloud Sensor")
- it's raining ("Rain Sensor")
- there is a short circuit at the Free Input ("Free input")
- loss of power in the main supply line of the observatory ("No Power")
- discharged battery of the usb card's stationary part ("Low Dome Battery")
- discharged battery of the shutter ("Low Shutter Battery")
- the connection with the computer controlling the observatory is lost - e.g. when it crashes or the driver is off ("PC Link")

Automatic closing the shutter in the case of discharged batteries depends on „Low Shutter Battery Treshold” and „Low Dome Battery Treshold” parameters. For standard 12V batteries a 11.5V value should be entered in these fields (gaps) or you should check it experimentally.

Moreover, the usb card's driver in controlling PC can close the shutter in the case the weather station detects bad weather conditions („Bad Weather” i „Weather Protect” functions) - e.g. strong wind, raining. Note that this option works only when the driver is configured and connected to a weather station. More information about this option, can be found in the Help file included with the program.

Max Fail Signal Count before shutter Close and Card Sensors Loop Time

The shutter is not closed immediately after the sensor activation. The signal on the sensor must persist for a specified number of measurement cycles. This allows to avoid temporary disturbances.

Time range after which the shutter closes is defined by two parameters:

Max Fail Signal Count before shutter close clk

Card Sensors Loop Time s

„Max Fail Signal Count” - determines how many times the signal must be measured so that the flap began to close.

„Card Sensors Loop Time” - determines the number of seconds at which the measurement signal will be carried out.

The time which has elapsed since the appearance of the signal at the input until the beginning of closing the shutter can be calculated from the formula:

Time To Shutter Close Start = Max Fail Signal Count x Card Sensors Loop Time

So, in the example given above it will be: $5 \times 5s = 25s$